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CITY COUNTY STATE

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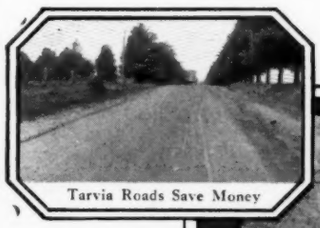
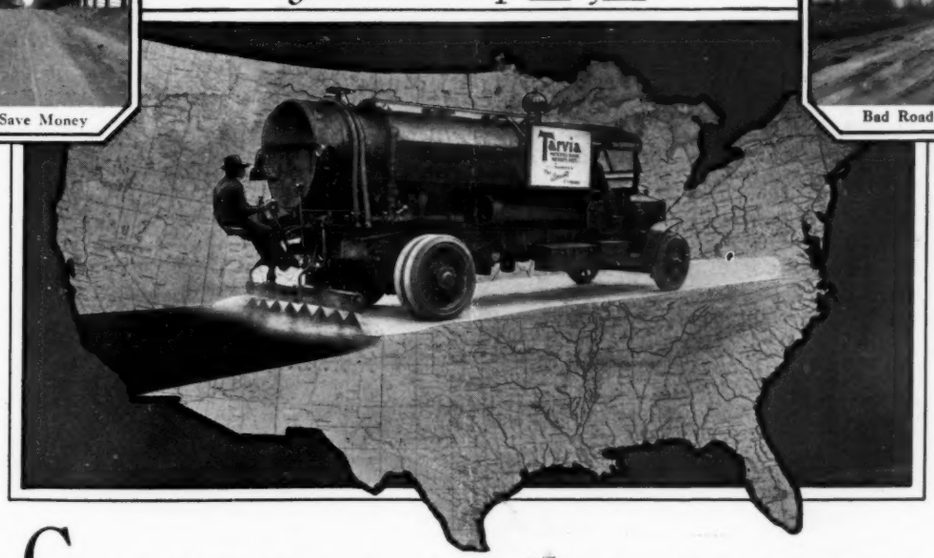

Tarvia Roads Save Money

Put your town on the good roads map this year

Bad Roads Waste Money



COME to think of it, is there anything so expensive to a community as *bad roads?*

Bad roads slow up business, lower land values, make markets inaccessible, isolate neighbors, cost a lot of money and waste much more.

People tolerate bad roads year after year because they *think* good roads cost too much.

But good roads *are not* expensive, if they are built in accordance with a well-thought-out program, somewhat along these lines:

Consider—

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2. Its initial cost—
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5. Ease and rapidity of construction—
6. What "Barrett Service" can do for you.

Thousands of towns and cities all over this country, have had their road problems economically, satisfactorily and quickly solved by the use of this popular road material.

No matter what your road problems may be—a road binder for new construction, a dust preventive, a preservative, or a patching material—there is a grade of Tarvia for each need.

IF YOU want to know how to get GOOD ROADS *in your community at* VERY LOW COST, *write today to our Special Service Department for booklet and data on this vital subject.*

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

Tarvia

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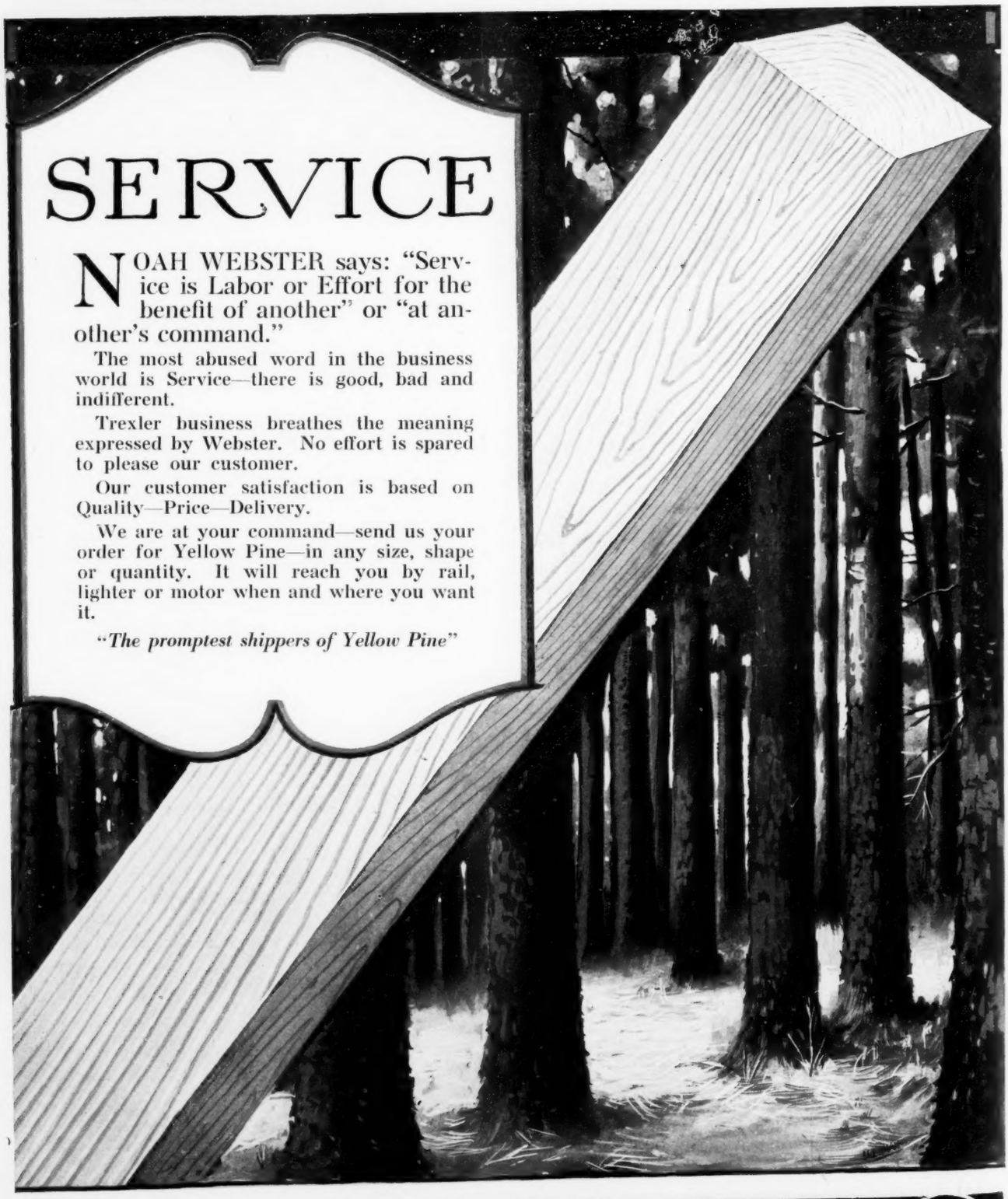

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Vol. 48 NEW YORK, FEBRUARY 14, 1920 No. 5

Flood Control Work in the Miami Conservancy District

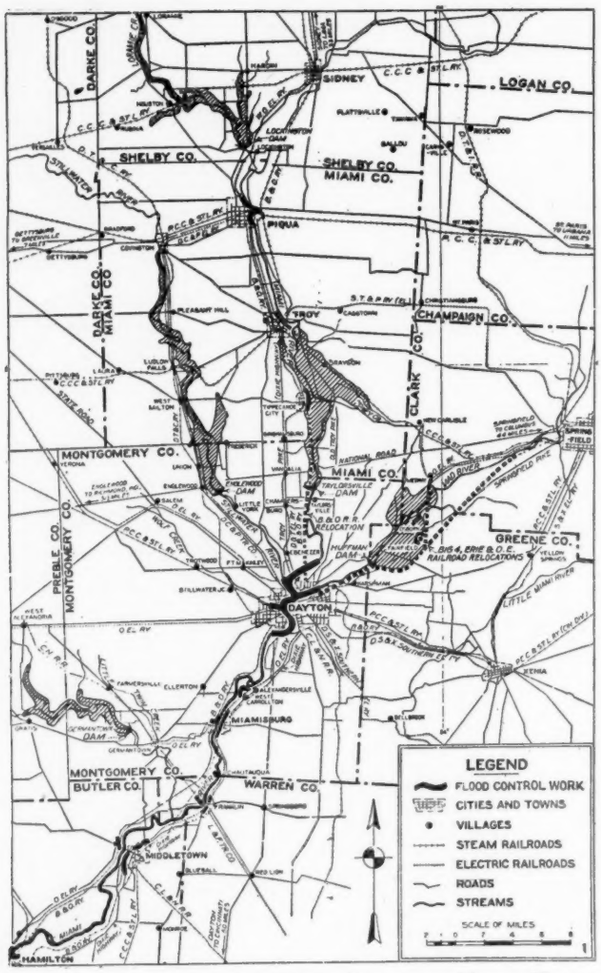
Heavy loss of life and property by the 1913 flood in the Miami valley necessitated the expenditure of many millions of dollars to prevent future disasters. State legislation authorized investigations, financing, administration and the design and construction of great dams and appurtenances and river and road improvements requiring the installation of a million dollars' worth of heavy contractors' plant and equipment, the provision and distribution of eight thousand electric horsepower for making hydraulic and dragline excavations, and the construction of eight million yards of embankment and nearly two hundred thousand yards of concrete. Improved specifications were developed and comfortable provisions made for maintenance and transportation of many hundred workmen.

Some of the most interesting construction methods employed in this work will be described in future articles. This one describes the general plan and the preparatory work.

To prevent recurrence of the devastating flood of 1913, which cost 400 lives and $100,000,000, there are now being executed in the Miami valley, Ohio, about $25,000,000 of engineering construction work, designed, after notably careful study and elaborate investigations and experiments, to control future floods and protect life and property. Part of the flood waters will be temporarily impounded in retarding basins formed by the construction of five large earth dams with open outlets that restrict the maximum flow through the improved river channels.

These dams will contain more than 8,000,000 yards

INCOMPLETE CONCRETE CONDUITS THROUGH GERMANTOWN DAM FLOODED WITHOUT DAMAGE.



LOCATION OF DAMS AND RETARDING BASINS IN MIAMI VALLEY.

of earth and 183,000 yards of concrete. They are being built by a combination of dumping and hydraulic fill processes, using millions of yards of material, much of which is excavated by enormous dragline machines operated by electricity, about 8,000 h.p. of which is provided and distributed for general construction purposes. More than a millions dollars' worth of plant and equipment have been installed and the heavy work is in an advanced stage of construction under the direction of thoroughly organized engineering and construction forces.

CONDITIONS.

The Miami river and its tributaries drain 5,430 square miles of a well populated, cultivated valley 120 miles long, in the southwestern part of Ohio, where the annual rainfall is about 36½ inches. The river channel slopes about 4 feet to the mile, and in consequence of the severe storm of March, 1913, it became the outlet for a flow of 250,000 second-feet of flood water that inundated wide areas of the valley, submerged some of the city streets to a depth of several feet, caused the loss of 400 lives and damaged Dayton, Piqua and other towns and villages and the adjacent country to an estimated amount of $60,000,000 to $150,000,000.

LEGISLATION AND ORGANIZATION.

In order to consolidate and perfect the flood protection operations of the different localities, the state of Ohio passed the Conservation Law, creating the Miami Conservancy District, composed of nine counties affected by the improvements. Each county is represented by its judge in a Conservancy Court, and three directors were appointed with executive powers. They retained experts who made a thorough investigation and recommendations, directed the preparation and execution of a protection system and also appointed appraisers to evaluate the damage and benefits resulting from the improvements. The directors issued bonds to provide funds for the execution of work by force account and by contracts awarded by the directors and engineers.

The Board of Directors is composed of Edward A. Deeds, president, Henry M. Allen, Gordon S. Rentschler, and Ezra M. Kuhns, secretary. Arthur E. Morgan is chief engineer, Charles H. Paul, assistant chief engineer, C. H. Locher, construction manager, and Oren Britt Brown, attorney. The headquarter's offices are located in Dayton.

Extensive surveys were made, records examined, measurements taken and flood prevention systems in other places were thoroughly investigated. After an exhaustive study of the problem, it was concluded that its best solution would be obtained by the establishment, in different portions of the valley, of basins that would temporarily impound the flood waters and, by retarding their flow through the improved river channels, would to a considerable degree equalize the volume of water and diminish its maximum depth there, at the same time that the inundated areas would be greatly restricted or eliminated.

CHARACTER OF WORKS.

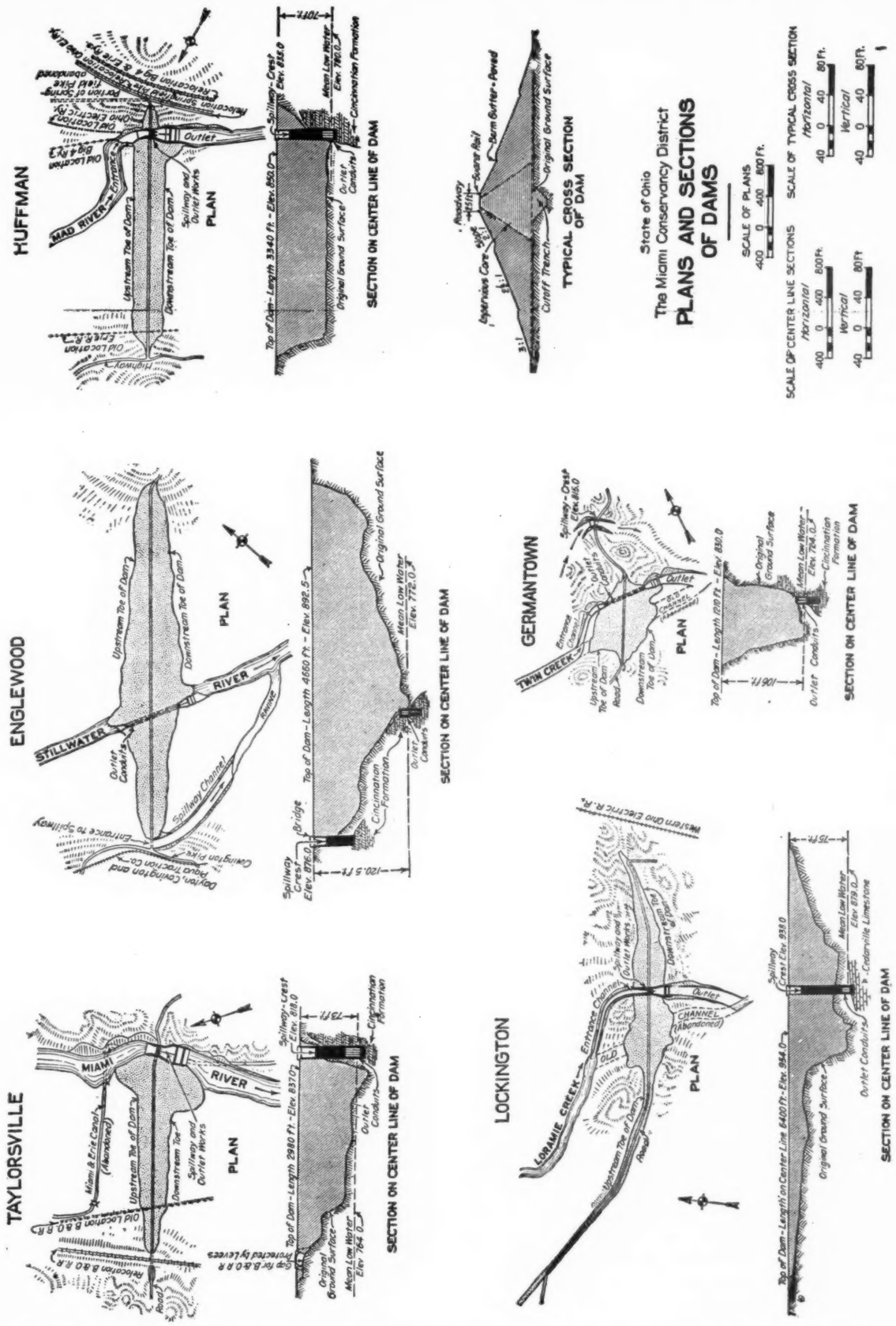
The system includes the construction of five great earth dams and their concrete overflows, sluices, conduits and other appurtenances; the protection of river banks and bottom with riprap, deepening, widening and straightening the channels; the relocation of many miles of steam and electric railway tracks and highways formerly located below the flood line of the retardation basins; the execution of considerable temporary and auxiliary work, and the provision of camps, shops, storage facilities and distribution and transportation appliances.

The improvements are designed to give protection from a flood twice as great as that of 1913, and to provide for the harmless run off, in three days, of a possible rainfall of 10 inches over the whole drainage area. For a flood of the same magnitude as that of 1913, it is estimated that the effect of the four dams above Dayton would be to reduce the flow of the river at that point from 250,000 second-feet to 100,000 second-feet.

IMPOUNDING DAMS.

The five great dams and their retarding basins, the latter having a combined area of 290,800 acres that will be submerged by a flood equal to that of 1913, would in such an event temporarily store 621,000 acre-feet of water. They are located one on each of the principle streams of the valley, namely the Miami, Stillwater and Mad rivers and on Lorraine and Twin creeks.

The most suitable sites for the dams were determined by topographical and geological surveys, by subterranean explorations made with systematic borings that



PLANS, ELEVATIONS AND CROSS SECTIONS OF THE GREAT EARTH DAMS WITH CONCRETE SPILLWAYS AND CONDUITS.

produced samples of the underlying strata, and by the location and testing of local materials for earthy embankments and concrete aggregate.

Each of the dams is located with one end and the spillway and conduit supported on ledge rock, and is provided with a concrete center core wall, spillway, and outlet. All are of the same gravity type and similar proportion illustrated by the accompanying cross section diagram, and where they are founded on porous material, the latter is protected by a 4-foot blanket of impervious material.

CONTROL OUTLETS.

The normal flows of the streams are provided for by the conduits and outlets through the lower parts of the dams which permit the low water flows to pass unobstructed down the channels. When the flow becomes sufficiently greater than normal, the surplus water backs up above the top of the outlet and is temporarily impounded in the retarding basin until it begins to flow over the spillway weir at an elevation of about 15 feet below the crest of the dam.

DESIGN OF OUTLET.

In times of flood, the velocity of discharge through a conduit may increase to 60 feet per second, necessitating very careful design of the outlets to enable them to safely endure the great hydraulic forces.

Original investigations of the flow through the outlets were largely possible through the generosity of Colonel E. A. Deeds, president of the Board of Directors. A large-scale model of one of the conduits was constructed, tests were made and experiments conducted in the hydraulic laboratory established on Colonel Deed's estate. They resulted in the adoption of a type of outlet fitted to absorb the mechanical energy of the water by the principle of the hydraulic jump. The outlets were designed with a flaring basin and with high side walls and a floor descending by steps to a pair of baffle walls or weirs.

SPECIFICATIONS.

A notable feature of the specifications is the attempt to emphasize the principle that they apply to two honorable contracting parties and are intended to conserve the rights and obligations of both without involving unjust or unnecessary obligations upon the contractor. A form of bond was adopted that is designed to provide full protection to the District without imposing upon the securities any unreasonable obligations.

The specifications are divided into three separate parts, of which the first two, relating to general conditions and to general requirements, are applicable to all work and are supplemented by the third part, detail specifications, that, with the agreement, estimate, and drawings, outline in detail how each kind of work shall be done and measured for payment. The general conditions govern the relations of the contractor, to the district, to the public and to his employes. The general specifications define and classify the principal materials and the method of executing the work.

A special system of index numbers and letters make very simple provision for reference and classification. The different items of construction work and materials are designated by serial numbers and any specification section referring to them is designated by its numeral followed by a decimal point, after which the item number is written so as to positively and briefly indicate the required information. These specifications for items were published in one volume for the five dams and in another volume for the channel improvement projects at Dayton and Hamilton, but the same numbers are applied to given items whether they occur in the channel improvements or in the dams or in both; and when followed by the letter A, refer to work located below the low water datum as indicated on the drawings.

INFORMATION FOR BIDDERS.

Before inviting bids on the construction work, there was sent to prospective bidders a pamphlet entitled "Information for Bidders," which contained the most complete data that could be secured in reference to conditions likely to be encountered, together with a list of proposed contracts, directions for preparing the bids, information regarding local supplies and material, laws, public service conveniences and statements of quantities.

Special effort was made to encourage local bidders of moderate or limited resources, by dividing the work into a large number of separate contracts which, however, were susceptible of combination so that they could

Dimensions of Dams and Appurtenances.

	Germantown Dam	Englewood Dam	Lockington Dam	Taylorsville Dam	Hoffman Dam
Drainage areas above dam, sq. miles	270	651	255	1 133	671
Maximum height above valley floor	100	110.5	69	67	65
Average elevation bed of river	723	770	876	759	777
Average drainage valley floor	730	782	885	770	785
Elevation of spillway crest	815	876	938	818	835
Elevation of top of dam	830	892.5	954	837	850
Maximum elevation of water surface for a flood like 1913	805	862	936	9 650	7 300
Area submerged in a flood like 1913, acres	2 950	6 350	3 600	9 650	7 300
Maximum amount of water stored in a flood 1913, acre-feet	73 000	209 000	63 000	152 000	124 000
Maximum average depth of water in reservoir in a flood like 1913, feet	24.8	32.9	17.4	15.7	17.1
Length of crest of dam, feet	1 210	*4 716	*6 40	*2 980	*3 340
Thickness of dam at average elevation of valley floor, feet	650	739	410	390	380
Length of outlet conduit, feet	546	709	45	40	40
Number of conduits	2	2	2	4	3
Total sectional area of outlet conduits, square feet	182	217	158	1 116	705
Maximum discharge of conduits in 1913 flood, second-feet	9 340	11 000	8 630	51 300	32 600
Length of spillway crest, feet	55	100	72	132	100
Vertical diameter of conduits (temporary), feet	22 ft. 10 in.	22 ft. 6 in.	.....	.....	.....
Vertical diameter of conduits (permanent), feet	9 ft. 1 in.	10 ft. 5⅝ in.	9 ft. 2 in.	19 ft. 2 in.	16 ft. 4in.
Maximum width of conduits	13 ft.	13 ft.	9 ft.	15 ft.	15 ft.
Yardage of earth in dams	790 000	3 550 000	1 032 000	1 131 000	1 547 000
Yardage of concrete in dams and appurtenances	20 000	38 000	38 000	47 000	40 000

* Including spillway crest.

also be executed in large units by contractors with adequate organizations and equipment.

The advertisement especially noted that the larger contracts contained numerous smaller items of work that might be sublet, and the chief engineer of the district invited communications from sub-contractors wishing to get in touch with the large contractors. The unusual political, military and industrial conditions prevailing at the time the work was commenced were such that but few bids were submitted, and only one, a proposal for levee work, was accepted.

CONSERVATION DISTRICT CAMPS.

As all of the five great dams, employing many hundreds of workmen in their construction, are situated in sparsely populated districts at considerable distance from large towns and without sufficient means for passenger transportation, it was necessary for the district to provide at each dam site a camp, which, after serving the construction forces for several months or years, is intended to have a permanent value. Topographical studies were made by an expert in city planning who laid out villages, each provided with cottages, a school house, stores, mess hall, just-aid station, and a community hall.

Available existing buildings, like large barns or tobacco sheds, were remodelled for bunk houses arranged with long corridors between the sleeping rooms, each of which has a double deck steel cot and an outside window. These are occupied by the single men who are charged 50 cents per week or, if they occupy separate rooms, are charged 75 cents and $1.00 per week. Meals are served at the camp mess for 35 cents each. The cottages, which have from three to five rooms, rent for $13.00 and $21.00 per month, and, like the bunk houses, are all equipped with shower baths. Where the work is of a more temporary nature so that the camps were not established and there were not sufficient local accommodations and transportation facilities, the men and materials are transported from headquarters by 54 District automobiles including eleven large Ford and Hudson touring cars, thirteen Ford light delivery trucks, four Ford runabouts, 8 Ford one-ton trucks, five Ford depot wagons, 7 Pierce-Arrow five-ton trucks and five Pierce-Arrow two-ton trucks.

All employes are treated solely in accordance with their character and workmanship and their right to organize is recognized. At each camp there is established a system of local self-government to which all camp members are eligible and by which all matters of local interest in connection with the general welfare are decided by a modified commission-manager form of organization.

An extended description of some of the important features of the service work is given in a paper by H. S. R. McCurdy, division engineer, which was presented to the New England Water Works Association at the convention last September, from which the accompanying diagrams are reproduced.

The Virginia Good Roads Association is making a drive to increase the membership to 5,000 paying annual dues of $2 each. It will employ a paid secretary and issue a monthly bulletin. Committees are assigned to enlist membership and steps have already been taken toward amending the state constitution so that bonds may be issued for the construction of highways. An educational campaign will also be carried on to instruct voters on the advisability of constructing good roads promptly.

City Planning

George H. Nye, city engineer of New Bedford, Mass., recently addressed the municipal section of prominent engineering societies on City Planning and Development, illustrating his remarks with views shown of changes made to relieve congestion in the centre of New Bedford.

Mr. Nye pointed out that his subject covers a wide range of topics, including the arrangement and construction of streets, sewerage and drainage systems, water supply and distribution, traffic regulation, lighting, schools, public buildings, civic centres and housing zoning.

Attempts to improve city planning service give rise in many cities, to a subdivision of work among boards, resulting in much waste of effort and lack of co-ordination. More recently, in a few cities, these matters have been placed in the hands of city managers. In Massachusetts these officials have no administrative authority; they simply advise. Under this system the tendency too often is to recommend changes that prove too radical.

Municipal engineers should be given more authority. "If the engineer is a man of vision, with the interest of the city at heart, he will plan consistently for all improvements which can best be reviewed and carried out by the elected officers of the city," he said.

It is estimated that in Decatur, Ia., the cost of paving in 1920 will be 20 per cent greater than for similar work done in 1919.

Cost Plus Contract for Ohio Road

A committee of the Ohio Legislature has filed a report stating that the cost of 1½ mile of brick, Highway No. 1, in Guernsey County, was $80,000, and that the time required for its completion was 1 year 28 days. The original contract having been canceled on account of war conditions, the completion of the work was done on force account plus a 10 per cent commission, plus rental for equipment and payment for teams. The report states that the force account contractor expended money recklessly and it condemns the cancellation of the original contracts under which $300,000 was paid for the completion of 11½ miles of road.

Governor Smith, in a message to the Legislature of the state of New York has recommended the immediate release of the ten million dollar balance of the second fifty million dollar bond issue for construction of highways, which is urgently needed to provide funds for the continued road construction planned for 1920.

After six years of litigation in an effort to widen a 500-foot block on South Salina street, Syracuse, the court has rendered decision in two cases, one of which permits the widening of one end of the block and the other prohibits widening at the other end of the block, thus rendering the proposed improvements impracticable.

Investigation of the proposed vehicular tunnel between New York City and New Jersey indicates that it will cost perhaps thirty million dollars.

Repairing a Damaged Reservoir

An English reservoir, located between two coal mines, was damaged by the settling of the ground over these mines, a crack 1⅛ inches wide crossing the entire reservoir. This was repaired by uncovering the bottom rock and placing over the crack in it a slab of reinforced concrete encased in a sheet of asphalt, on top of which was relaid the original bottom lining.

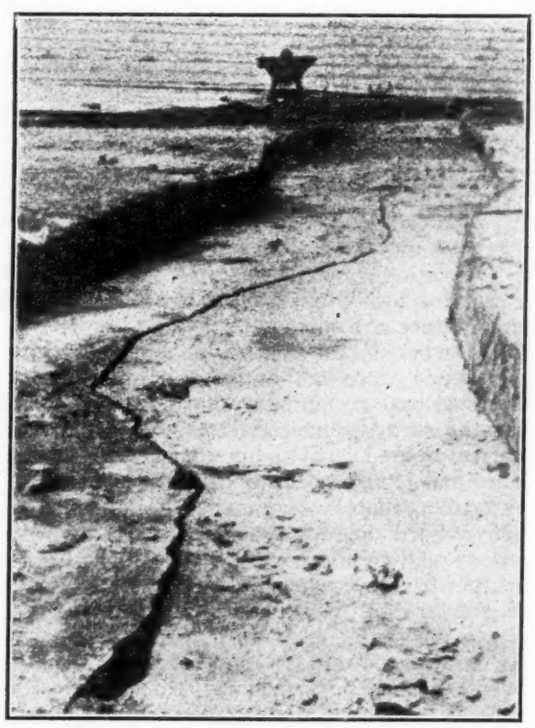
The Downhill reservoir, belonging to the Sunderland and South Shields Water Company, was constructed in 1899 with a length of 220 feet, breadth of 150 feet and depth of 17 feet from floor to top of coping, with a total capacity of 3,000,000 gallons. The walls were of stone masonry. The floor construction consisted of 12 inches of concrete on the limestone rock (which had previously been leveled off), covered with 18 inches of clay puddle. Both of these extended under the wall, the puddle under the wall being mixed with gravel. Over the clay puddle was laid a floor of cement concrete flags 2½ inches thick, the joints between which were run with cement grout; a thin bed of sand being placed between the puddle and the flags. The floor was divided longitudinally by eight 10x16-inch concrete curbs to facilitate cleansing.

The reservoir is situated between two coal workings, which were 1,770 feet below the surface at this point. The damage to the reservoir to be described was apparently due to a slight settling over each of these workings which caused a longitudinal motion in the two directions, resulting in a crack or parting in the rock at the site of the reservoir.

In June, 1916, a joint in the coping was observed to have opened about a quarter of an inch and later a crack of the same width was traced down the wall and across the floor, with a slight crack in the opposite wall. Plugs were put in the masonry to permit measuring the movement. This was very small however until July, 1917. At this date it was found that fissures had opened also in the fields southwest of the reservoir. There was very little if any additional movement until March, 1918. On March 21st the company received a telephone message to the effect that the floor of the reservoir had suddenly given way and the whole of the water escaped. It was found that the crack entirely across the reservoir had increased to a uniform width of 1⅛ inches, the crack extending through the walls, puddle and concrete flooring. The crack was also found extending to the east and west of the reservoir. With the rushing out of the water, a considerable amount of clay puddle had been washed down into the fissure and allowed several patches of the floor flagging to fall into the depression.

The method adopted for repairing the reservoir was affected by the consideration that it was probable that coal would continue to be drawn from the area on either side and that consequently further movement might take place. Such movement would probably be not in the nature of a true subsidence but rather a lateral movement which would tend to open the cracks still further. It was therefore decided to attempt to repair the floor by use of a sheet of bituminous material and a reinforced concrete mat in such a manner that, even if further movement of a similar character should occur, the reservoir would remain water-tight.

After removing the concrete flags and the puddle from both sides of the break, the crack was found to extend through the underlying concrete, and this was cut out to a width of three feet on either side of the crack and down to the limestone rock. The rock also was excavated to a further depth of about 9 inches, the bottom of the cut being given a V shape. This channel in the rock was then filled with concrete which was brought up level with the general surface of the rock and the whole was given a smooth surface by means of cement mortar. Sheets of bituminous material were then laid in the channel in the concrete reservoir bottom, the sheets being lapped and jointed and the edges left standing up sufficient to allow of six inches being turned over on top of the reinforced concrete mat. This mat was then placed, being made eight inches thick and reinforced with expanded metal of 3-inch mesh with ample lap at the joints. After this mat had set, a layer of bituminous sheeting was laid over the whole of its upper surface



Crack in Rock in Reservoir Bottom.

and the edges of the bottom sheeting were turned down and joined on to this top bituminous sheeting. The fissure was thus bridged with a slab of reinforced concrete which was entirely encased in bituminous sheeting and rested on a smooth surface. At the ends of the concrete mat the bituminous sheeting was turned up and the ends cemented in to a chase cut in the stone wall.

This mat was covered with concrete brought up to the level of the original concrete floor, except that a gap two feet wide was left in the concrete directly over the fissure; the idea being that a certain amount of sliding might take place between the reinforced concrete mat and the rock beneath it and at the same time between the mat and the concrete floor above it, in which case

the gap in the concrete flooring, which was filled with clay puddle, would provide a more or less elastic joint between the two halves of the reservoir floor. Puddle and concrete flags were then replaced as in the original construction.

The cracks in the walls were pointed up on the front and back faces and were then run full of cement grout. To permit this, shafts were sunk at the backs of the walls down to the concrete foundation, and it was found that the cracks in the backs of the walls in each case corresponded exactly to those in the front. After the pointing in the cracks had set, the cracks were washed out thoroughly with clean water and cement grout poured in. A tub full of grout was mixed at a time so that a constant stream could be poured into the crack until it was filled. Grout containing 9 bags of cement was poured into the west wall and 7½ bags into the east wall.

The rock under the foundations of the west wall at the point of fracture was found to be so badly broken that it was necessary to drift through underneath the wall and bridge over the fissure by means of short lengths of steel beams embedded in the concrete, the gravel puddle being replaced between this and the bottom of the wall and rammed thoroughly into position before the grouting was begun.

The author expressed the opinion that if service reservoirs must be constructed in districts subject to surface damage due to mining operation, it is very much safer to locate them on ground from under which the whole of the coal is to be withdrawn than upon that over or in the vicinity of barriers which are not to be worked out. In the first case, subsidence may take place without serious damage being sustained; but in the latter case, when damage is caused it is almost certain to be of a serious nature and to extend over a considerable period of time.

We presume that the same danger of rending apart of the foundation rock might occur in the case of large quarrying operations on one or both sides of a hill on which a reservoir is located.

Fighting Water Shortage in Norfolk

It having been reported that there was a shortage of water in Norfolk, Va., which threatened the fire protection of the city, the National Board of Fire Underwriters investigated the conditions on January 15th. The result of the investigation is given in a bulletin of the board which has just been issued, the conclusion being that "the situation in regard to fire protection cannot be considered critical, so long as the present precautions are continued."

The city obtains its water supply from lakes having a normal storage of about 2,000 million gallons, but due to the abnormally low rain-fall of 1918 the storage has been lowered to 300 million gallons. The water department has installed electric or gasoline-driven centrifugal pumps at various points so as to be able to utilize all of the water in the various lakes. It is estimated that between 5,000,000 and 8,000,000 gallons a day of ground water is reaching the lakes. In extreme emergency salt water could be pumped into the lakes.

LIMITING CONSUMPTION.

The normal daily consumption of the city is about 12 million gallons and the normal pressure about 50 pounds. On December 4th, in an effort to decrease consumption, the policy was adopted of reducing the pressure to 8 pounds from 10 p. m. to 6 a. m.; to 20 pounds from 6 to 7 a. m. and from 5.30 to 6 p. m.; 12 pounds from 8.30 a. m. to noon, from 1 to 5.30 p. m. and from 8 to 10 p. m.; and 40 pounds from 7 to 8 a. m., from noon to 1 p. m. and from 6 to 8 p. m. The city is practically level and probably in no part would the pressure fall below 8 pounds. The pumping station receives all alarms of fire on a gong over a fire alarm circuit and a telephone also is provided. On first alarms, additional pumps are primed if necessary, and on second alarms or special calls the pressure is immediately increased to 45 pounds. The result of lowering the pressure has been a decrease in consumption to about 7,000,000 gallons a day.

The water has a slightly brackish taste at present and, although tests show it to be safe, it is objected to for domestic purposes and the city is hauling water in tanks and sprinkling carts from private supplies and distributing it to those who wish it.

EMERGENCY MEASURES.

Work has been started on an emergency connection with the Berkeley supply. A 14-inch submerged main crosses the river from Portsmouth to Berkeley and from the terminus of this line a 16-inch main is being laid to the bridge leading to Norfolk, from which point a 20-inch pipe will be laid to Water and Main streets. Two 2,225,000-gallon electrically operated pumps are installed at the terminus of the 14-inch line. From 2,000,000 to 3,000,000 gallons a day will be available from this source.

It is also planned to start work at once on a nine-mile line of 20-inch main laid on the surface of the ground to Lake Drummond, through which to obtain a temporary supply of 8,000,000 gallons a day, which line it is expected to have in service by the middle of April.

On February 17th a bond issue of $6,000,000 for a new supply will be voted on, plans for which supply are now being made. These plans include laying a 36-inch line to Lakes Phillips and Burnt Mills, 18 miles away. A reservoir will be built at the lakes with an average depth of 12 feet and a capacity of 3,100 million gallons. These lakes will give a supply of 15 million gallons a day, with further development possible. This water will be pumped into the distribution system at a point opposite where the present supply enters.

As additional present precaution, the fire department has made a careful investigation of the docks along the water front and has located 24 points where pumping engines can take suction. The fire captains have been instructed as to these locations and the owners of property at these points have been ordered to keep the docks and roadways to them open. On first alarms along or near the water front, all motor pumps respond, the steamers being called later if needed.

The engineer of the board, Robert C. Dennett, reports that the city officials are doing everything that can reasonably be expected to maintain adequate fire protection. While the pressure throughout the city is below

normal most of the day, enough water for a first stream is available at any hydrant and, with the electric pumps in service, additional pressure can be obtained in two or three minutes, so that "as long as the means of transmitting alarms to the station are in service and are promptly utilized when necessary for increasing the pressure, the situation in regard to fire protection cannot be considered critical."

Electric and Gas Engine Pumping at Milltown

By Samuel Speirs.*

Both types of engines installed at the outset and both used, electric regularly and gas for emergencies. The author describes the operating costs and the various features of each kind of service.

The pumping station of the municipal water works, of Milltown, N. J., affords an interesting chance to compare the merits of electric-motor driven water pumps and gas-engine pumps.

Installed in a one-story brick building 30 x 26 feet, which cost $2,240, are two complete pumping units of the same capacity (350 gallons per minute), consisting of two Deane triplex 10 x 10 inch plunger pumps; one driven by a Wagner 30 h.p. 2-phase motor and the other driven by an Ingego 30 h.p. 1-cylinder, 4-cycle gas engine. The electric-motor driven pump consumes in one hour 17.5 k.w.h. at $.025 per k.w.h., which is $.437 per hour. The gas-engine driven pump consumes in one hour 550 feet of gas at $1.15 per 1,000 feet, which is $.6325 per hour.

Electric Motor—The electric motor is equipped with an automatic start and stop apparatus actuated by a pressure coil which is very sensitive and invariably stops the motor when the water in the standpipe is within two feet of the top. The gas engine can have no attachment like this.

It is our practice to have a man call at the station at eight o'clock in the morning to change pressure-recording chart, record gallons pumped, oil and grease the pump, and then start the motor by hand, wait until motor comes up to speed and all three cylinders are primed, and then leave the pump to take care of itself. The whole operation takes but 15 minutes but counting the time used going and getting back to regular place of work, one-half hour is gone. At four o'clock in the afternoon he visits the station again, throws in the starter and again leaves, making a total for labor of one hour a day.

The reason for starting by hand is that by so doing we keep off the night load and thereby keep down the maximum demand, with the resultant reduction in the rate paid per k.w.h., as we purchase our current from the Public Service Corporation of New Jersey on their well-known wholesale power plan. The automatic starter will operate upon the opening of a fire hydrant, which is a great advantage for plants where an engineer is not always on duty.

Gas Engine—The gas engine is equipped with an air compressor and storage tank by which the starting of the engine is but little more work than starting the motor. But as it has not been deemed advisable to go away and leave the gas engine running without attention, as it has no automatic stop, and we are pumping a daily average of 84,000 gallons at 350 gallons a minute, it would be necessary for a man to stay at station four hours daily in addition to the one hour used for starting, changing charts, etc., making five hours labor daily to be charged against the gas engine, in comparison to one hour daily for the electric pump.

The gas engine and pump were originally installed as an emergency unit in case of failure of electric current or breakdown of the electric motor pump, and was so used on two occasions in January, 1918, when the electric current was taken off by the Public Service Corporation on account of the shortage of coal. It is also used occasionally to keep it in condition.

As to noise, the gas engine is the more quiet in the station, due to the fact there is but one gear reduction while on the electric motor pump there are two. But as the exhaust is outside the building and discharges into the atmosphere it can be heard for a considerable distance, while the electric motor pump cannot be heard 200 feet from the building. Cooling water must of course be run continuously while the gas engine is run.

The space occupied by gas engine is 16 x 10 feet and by electric outfit 8 x 10 feet. First cost for furnishing in place with foundation and appurtenances for gas engine and pump was $2,930, and for electric motor and pump, $2,480.

The gas pump has pumped 1,000,000 gallons and the electric-motor pump has pumped 73,000,000 gallons and has been in operation since May, 1915, and during that

* Superintendent of Water Department,, Milltown, N. J.

time there has been absolutely no repair to gas engine or pump, and to the electric motor pump one gauge glass costing eighty cents has been broken.

In case of fire it is possible to run both units at once, thereby increasing the gallons per minute; and by closing the valve at the standpipe we can increase our pressure from an average of 60 pounds to 100 pounds. On account of the labor cost and the difference in fuel cost we rely on our electric-motor pump to do our regular pumping, and fall back on our gas-engine pump in emergencies.

This plant was designed and built under the supervision of Clyde Potts, of New York City.

Scavenging Privy Vaults

Machine cleaning was tested by engineers of the Public Health Service, who found it much cheaper, less offensive and more sanitary than hand cleaning. The figures of the test are given.

In a considerable number of cities in the southern states sewers are found in only a few streets or not at all. The serious danger of typhoid epidemics from open privies has led the Public Health Service to conduct a campaign for minimizing this danger by the construction of tight concrete vaults, protected from access by flies by a superimposed structure thoroughly screened. This involves a method of periodically cleaning the vaults in a cheap as well as sanitary and inoffensive way, which the ordinary hand cleaning is not.

Recently tests were made at Fayetteville, N. C., of the scavenging of such vaults (removing their contents) by means of a portable pumping outfit such as is used for cleaning catch-basins, this test being conducted at the request of the Public Health Service and under its supervision. The machine used was furnished by the Springfield Engineering Company, and we are giving herewith the official figures through the courtesy of that company. Judging from this test, the engineers of the Health Service concluded that with this machine vaults can be scavenged at a fraction of the cost of hand work, with lack of ordor, without leaking or splashing and in a sanitary way.

The machine used consisted of a 1,200-gallon tight steel tank, with a centrifugal pump, mounted on a 5-ton motor truck chassis. The pump is driven by the truck motor, draws water from the tank and, forcing it through a jet opening in the intake line, creates a vacuum in the suction hose. For breaking up solid material a jet of water under pressure up to 120 pounds can be used for reaching the vaults.

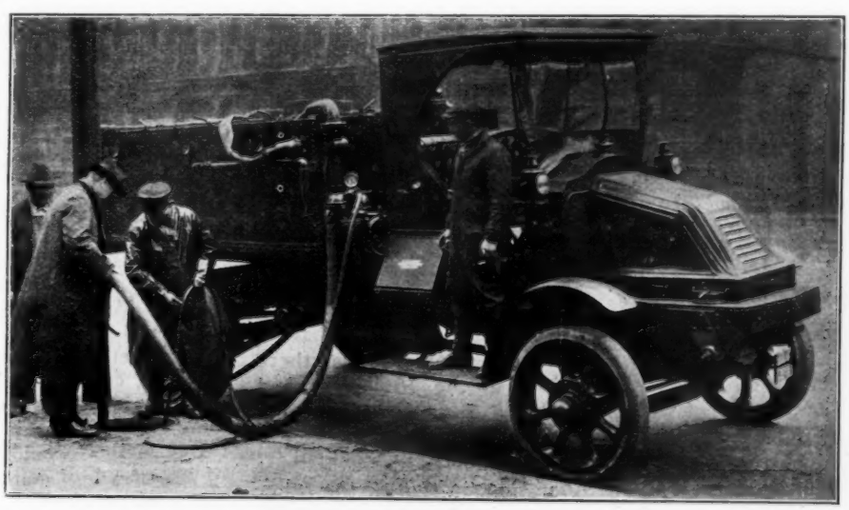
Eight vaults of 110 gallons capacity each, six of which were full and two partly full, were scavenged in 22½ minutes. Four vaults were reached from one position of the machine, and the other four from another position, one minute being required to move the machine. In order to determine the time necessary for dumping, this load, with the tank not yet completely filled, was dumped into a sewer manhole. Returning from dumping, the machine scavenged five more vaults, three of which were completely filled with very thick, unctuous and gumbo-like material, in 20 minutes, including a short stop to take on water. This gave an average time per vault of 3.2 minutes, or 4.2 minutes per filled vault, for scavenging only.

The trip to the dump three-quarters of a mile away, dumping, and returning required 40 minutes over rather poor roads. The test began at 3 p. m., scavenging the thirteenth vault ended at 4.32 p. m., and dumping the second load was completed at 5.00

The actual time of scavenging full vaults varied from 30 seconds, where the content was very liquid, to 5 or 6 minutes where it was quite solid or full of rags, chips, etc.

The engineers estimated that with water-tight vaults, installed convenient to alleys or other passageways, with scavenging routes laid out for economical service and dumping stations near the ends of routes, the time required would not exceed 1 minute for laying suction pipe and water line, 5 minutes average time for cleaning vault, 1 minute for picking up suction and water lines, and 3 minutes for moving machine to next vault; a total of 10 minutes. Where more than one vault or compartment can be reached from a single position of the machine, the time would be corresponding less. Allowing 40 minutes for dumping a load containing the contents of 8 vaults, 32 vaults could be cleaned in an 8-hour day.

Given a cost of machine of $7,500 with 6 per cent interest and 20 per cent depreciation, $500 a year insurance, $60 license, $300 maintenance, $600 annual overhaul, driver at $5 and two helpers at $4 each, and $300 for garage rental, the daily fixed charge for 300 working days would be $25.37. The mileage charges, on a basis of 50 engine-miles a day, are figured $4 for gasoline and oil; and on a basis of 20 miles travel, the tire charges are $1. This gives a total operating cost of $30.37. At only 32 vaults a day this gives a cost per vault of less than $1. At three cleanings a year this give a cost 1or scavenging of about $3 a year.



APPARATUS USED FOR SCAVENGING VAULTS AT FAYETTEVILLE, N. C.

Municipal Co-operation in Hydro-Electric Power

Ontario municipalities co-operate in producing and distributing current through the Hydro-Electric Power Commission, each municipality operating its own distribution system. In 1918 166 municipalities served 183,357 customers in this way. Cost and income figures are given.

Throughout a considerable area of the province of Ontario, Canada, the municipalities obtain current from central hydro-electric plants which are operated on a co-operative basis under the control of the Hydro-Electric Power Commission of the province. The report of this commission for the year ending October 31, 1918, has recently been published.

The cities obtain current from a number of plants, 117 of them from the Niagara system, 16 from the Severn system, 5 from the Wasdell's system, 19 from the Eugenia system, 5 from the St. Lawrence system, 1 from the Thunder Bay system and 3 from the Muskoka system. The report contains itemized accounts of the transactions of the several systems and also of the several municipalities, showing the results of the co-operative operation of the plants and municipal distribution of the current. Periodical inspections were made of the accounts of each of the muncipalities, the local officers being assisted by the commission in the installation and use of improved methods of office routine. In the smaller towns and villages, where the utility was in charge of men with little or no bookkeeping experience, the accounting was in many cases done by the members of the municipal auditing staff of the commission.

EARNINGS AND COST.

A system of monthly balance sheets and quarterly operating reports enabled the provincial commission to keep in close touch with local conditions. The capital expenditures and operating expenses were periodically divided into the principal revenue accounts, lighting, commercial power, municipal power and street lighting, and these in turn were set against the respective revenues for the purpose of rate adjustment and service cost. This enabled the commission to authorize and enforce a schedule of selling rates in each municipality so that each of the above-named revenue departments would be self-supporting, and excessively high rates in one were not made to balance a deficit in another.

The percentage of net debt to plant cost for the year showed a decrease from 75.5 per cent to 71.0 per cent. Of the 166 municipalities reported, the revenue in 124 was sufficient to take care of all operating and fixed charges and depreciation; in 26 others the fixed charges and part depreciation were met, and in only 16 was there an actual loss. The gross loss in the 16 last named totaled $15,635, of which $7,798 was due to the abnormal cost of operating a steam plant by one city where but a limited amount of hydro-electric power was available; and $3,964 was due to the operation, in two of the other cities, of local plants before transmitted power was available. The total accumulated deficit of all of the municipalities up to the end of 1918 was $27,884, while the accumulated surplus and reserves was $7,805,473. At the end of the year the system was serving 183,357 customers and a population of approximately 1,205,000.

The rate per horse-power collected from the municipalities varied widely. The lowest rate was at Niagara Falls, $11.50, while $14 was charged in four different municipalities. The price ranged from this to $69.34 in one municipality.

FIGURES CONCERNING MUNICIPALITIES.

The number of municipalities obtaining current in this way increased from 28 in 1912 to 166 in 1918. The total earnings in the former year were $1,617,674, and in the latter year were $7,082,039. In 1918 the surplus was $1,136,860 and the depreciation charge was $718,162. The total assets in the plant property were $22,352,951, in addition to which there was $26,941,248 in bank balance, inventories, sinking funds and other assets. The total liabilities were $19,143,775.

The municipalities were of a very wide range of population, 37 having less than 500 population, the majority of the others being below 10,000, while Ottawa had 100,561 population, Hamilton 104,491 and Toronto 460,526.

In the Niagara system (by far the largest) the total costs for the year for power furnished to municipalities were as follows: Power, $1,137,263; operating, maintenance and administration expenses, $335,082; interest, $411,570; total, $1,883,915. The average horse-power furnished to all the municipalities was 128,711 and the total revenue from municipalities was $2,451,661. In addition, there was furnished to companies 28,118 average horse-power, the total expenses of which service were $370,422 and the total revenue $483,547. In several instances the balance at the end of the year showed a deficit in the accounting between the system and individual municipalities, these deficits totaling $27,642; but the total of the surpluses was $265,951.

RATES CHARGED.

The lighting rates charged by the several municipalities varied to a greater or less extent. For the domestic rate a uniform charge of 3 cents per hundred square feet was made by all municipalities, and for the first three kw. h. per hundred square feet the prices varied from 2 cents to 10 cents per kw. h., and all additional varied from 1 cent to 10 cents. Commercial rates varied from 4 cents to 18 cents for the first thirty hours, from 1.2 to 10 cents for the next seventy hours, and from 0.15 to 10 cents for all additional. There was a uniform discount of 10 per cent for prompt payment in all municipalities except one, where a 20 per cent discount was allowed.

Fate gasoline locomotives have been extensively used and have given satisfactory service on the flood prevention work in Miami Conservancy District, where 3-ton locomotives on 3-ft. service tracks have been employed for hauling concrete from the mixers to the great dams, core walls, conduits, culverts, bridges and other construction now in progress in the district, much of which has been mentioned from time to time in these columns.

One of the locomotives has developed a record efficiency of 198 cu. yd. of concrete hauled in one day. The locomotives, although not operated by skilled mechanics, are stated to have been remarkably economical in their consumption of fuel and lubricants.

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Come Early and Avoid the H. C. L.

A statement from the Delaware State Highway Department that contract bids in response to invitations issued late in the season were in some cases 15 per cent. higher than earlier ones for similar work emphasizes the economy of preparedness for construction.

When road work and paving are determined on, plans, specifications, estimates and contracts should be prepared in complete readiness for the letting, the invitations issued early, plenty of time given bidders, and the awards made promptly.

Engineers and other city officials should co-operate for quick, thorough action. Standard work, under known conditions, and with more pay looks so good to a winter-bound contractor, that he will often hurry to make a low bid that he would scorn a few weeks later when things open up.

Besides the effect of the dull season and the opportunity to make thorough preparations that minimize cost, prices of plant and materials are likely to be at a lower ebb than later and deliveries much easier and safer. Now is the time, it is a public duty to save dollars by saving days.

High Class Mountain Highway Construction

The construction in the outskirts of the New York Metropolitan district of a short length of very costly and difficult highway now in progress, is a notable example of up-to-date policy and improvements of commercial and scenic lines and a commendable object lesson in conquering physical difficulties. The location of this road, 400 feet above the adjacent river, along almost vertical rock cliffs and precipitous slopes, where the material was treacherous and no paths existed, made it exceedingly difficult and costly to install heavy plant and equipment ordinarily used for such work or to deliver the necessary supplies and materials.

The difficulties were materially increased by the danger of jeopardizing traffic on the parallel railroad immediately below the highway, and by the exposure to very severe weather conditions that limited the construction operations. These features resulted in an unusual combination of methods by which the grading and building were simultaneously attacked at several different points where careful and costly hand work was supplemented by such mechanical aid as could be made available. Rocks were carefully broken and deposited in safe places, large quantities of treacherous material were removed to prevent the possibility of land slides, explosives were cautiously used, surveyors and drillers alike worked with safety lines, while drills and hoisting engines were operated by air pressure carried up the mountain side where coal could scarcely be transported, and plans and estimates were made for cableways, gravity inclines to replace mule tracks, and pack trails over which machinery and supplies were at first delivered.

The wise and liberal character of the management is especially indicated by the unusual flexibility authorized in location and construction that permit the line to be shifted as conditions are disclosed that make it possible to avoid difficulty or diminish cost by immaterial deflections. Much experience has been gained and improved methods have been developed in the four years of progress since the work was commenced, and it is a matter of satisfaction that the work suspended by the cancellation of the original contract has been resumed under a second contract awarded to the same contractor who has the advantage of great familiarity with the site and requirements, has trained his employees to efficiency under the unusual conditions, and is able to select and install the most desirable equipment, thus executing the work in accord with high standards, unusual experience and engineering supervision thoroughly familiar with the difficult problem.

Unionizing Municipal Engineers

In view of the fact that quite a number of engineers in municipal employ in this country have joined unions affiliated with the A. F. of L. and near-unions, the following from the English "Municipal Engineering & Sanitary Record" referring to similar action in that country is of interest.

"We have had to refer in our columns during the last two years to the indifferent treatment meted out by Irish County Councils to their chief and assistant surveyors. The salaries paid them are often as meagre as £120 a year, out of which they have to pay their own traveling expenses. These councils yielded in a very undignified manner to applications for increases of their laborers' wages when made through the secretary of their Laborer's Union. Recently the assistant surveyors and clerks in the offices of the Galway County Council applied for the enforcement of the civil service award in connection with their salaries, but the application was turned down. These officers have, as a consequence, been driven into the Irish Workers' Clerical Union, which body lost little time in telegraphing the clerk to the County Council that a strike of the officials would commence as from Saturday, the 20th ult. Inasmuch as all the clerks are involved, it means that expenditure entailed in the upkeep of the roads, the asylums, workhouses, and hospitals, the payment of doctors, nurses, and staffs, and of workmen on the roads would be suspended, whilst the supervision of the latter would be entirely withdrawn. The county surveyor deemed it imperative, we understand, to lock out the whole of the workmen—over 900 in number—and the administration of the county, we are told, is at a standstill. Whilst we should prefer that disputes between local authorities and their professional and indoor staffs were settled without recourse to strikes, it appears that the attitude of some authorities leaves such staffs without any alternative.

"Corporations and county and district councils in England have also given way almost every time a demand has been made on behalf of the out-door employes through their trade unions for increases of wages. This may or

may not have been politic on the part of these authorities, but it has had the effect of strengthening trade unionism, of whetting the appetites of the laborers for more, and of causing serious discontent among the professional staffs and clerical workers. The councils, it must be recognized, play their cards with very indifferent judgment. To give way with extraordinary alacrity to demands made by trade unions, and when the professional and indoor workers—who have not yet got their union—apply for increase of salaries such applications are turned down in a very unceremonious manner, is in our opinion, singularly myopic. It is an incentive to grave discontent, for laborers' wages are often increased to a figure higher than that of the brain workers. Officials well know that local authorities would rarely refuse with such scant courtesy their reasonable applications for increases if, like the laborers they were fortified by a trade union. Such authorities are consequently encouraging, through their erroneous and short-sighted policy, the spread of trade unionism."

Demand for Engineers Increases Salaries

The following review of present conditions throughout the country as to demand for engineers and salaries being paid them has been prepared by the American Association of Engineers and made public under date of January 30th.

Resumption of activities in the engineering field as viewed by the service department of A. A. E. has come quickly in various quarters where a year-end pause had been witnessed, and existing conditions differ sharply from those of last year when hesitation was nearly everywhere manifest. This condition is bringing about a situation of acute demand for technical service, which it is safe to say is without precedent. In order that contracts can be completed or even started, and in order that the enormous amount of necessary designs for new construction for enlargements of many existing plants and for maintenance of plants now in operation to cope with the present day industrial expansion, the lack and urgent need of professional engineers is extremely serious.

It is this situation, which is as evident in the West and South as in the East, that is gaining for the technical engineer that just recognition not only in point of remuneration but for the professional services which he renders. Never before has there been such a predominance of favorable features for the engineer. The demand is greater than the supply can hope to equal. This is making it necessary for the employer to resort in outbidding his competitors in order to increase his staff. As a result remuneration for technical engineers is through necessity increased in most quarters.

The greatest demand at present is for experienced designers and draftsmen on structural steel and reinforced concrete. Many calls are received for architectural draftsmen mostly for industrial work. A great amount of construction work will be started soon which will result in the need for many engineers of construction experience, who, during the winter months, have in many cases been working along other lines. Engineers of mechanical and electrical experience are in demand, particularly graduates who are competent in theoretical calculations. There is a great need for editorial men and instructors in our engineering institution. Also rsearch, promotional, and production engineers.

From a wide variety of sources covering the entire country, the average salaries paid the engineers are as follows: Tracers, $125 per month; detailers, structural, mechanical, and electrical, $175 to $200, a few companies paying up to $225 per month for experienced men; designers on all classes of work, $250 a month and up; estimators and checkers, $300 per month; rodmen and levelmen, $125 to $150 a month; instrumentmen, $175 to $200 a month; assistant engineers, $200 and up per month; map draftsmen, $200 a month; surveyors, $175 a month; research engineers, $275 per month and up. The salaries of engineers who have reached the executive class depends entirely upon the specific organizations with which they are connected. The salaries of production engineers, chief draftsmen, chief engineers, and superintendents of construction range anywhere from $3,000 to $15,000 per annum and more in the large corporations.

The program for the expenditure of almost a billion dollars on highway construction during the current year will result in the need of many engineers for highway work. Information as a result of canvass of state highway engineers indicates that at the most conservative estimate, no less than 5,000 engineers will be needed in 1920 to carry out this program. Appointments are usually made first as junior highway engineers, which salaries range from $175 to $200 a month, depending upon the state. Promotions to positions of greater responsibility in highway departments are usually made through civil service from men already on the staff. However, in a few states appointment to position of resident engineers, assistant engineers, and inspectors are made direct by application.

The Great Outdoors

Civil engineers as a class are lovers of the great outdoors. To many of them, the opportunity which engineering offers to satisfy the longing to be out in the open was an important argument in deciding them to adopt this profession. The editor, on reading the following quotation, found it so eloquently expressing his own feelings that he believes that other engineers will appreciate it also. It appeared in the house publication of the East Iron & Machine Company, which is published under the name of "Eimco," and was as follows:

Get Out in the Open.

"Did you ever notice how many people there are who smother their instinctive love of nature; lead an almost artificial existence and form artificial taste? They take automobile rides in summer, not to enjoy nature, but to create a breeze. They golf only for the game, and are seldom drawn out by the allurements of nature or the exercise to be gotten by a walk in the woods or open. In winter they ride in closed, heated cars and fret about the time spent in getting from radiator to radiator. When the winds begin to howl, and snow settles around in drifts they're afraid to venture out on foot to see winter and feel the rigors of old Jack Frost.

"There are those who really love nature in all its moods and seasons. They tramp over the hills without games to stimulate their interest; enjoying the sweet scented blossoms and green foliage in the springtime and the blizzards of the winter.

Numbering Highway Bridges

A comprehensive system modeled after the Dewey system of cataloguing has been developed for identifying the highway bridges in Mercer County, New Jersey. The numbers indicate township, stream, the main stream of which it is tributary, and the number of bridge counting up said stream from its outlet.

The engineer of Mercer County, New Jersey, Harry F. Harris, in a paper presented before the New Jersey County Engineers Association last January, described a system of numbering the bridges of the county which he had developed. Some such system seemed necessary in order that exact information concerning each bridge might be recorded and all bridges be put and kept up to a standard of strength and condition.

To meet this need with a simple, elastic and comprehensive system, Mr. Harris decided to use a modification of the "Dewey Index System," which he described as follows:

It was first decided to subdivide the county into nine districts, and for convenience the townships were used for this purpose, each district or township being assigned a key number; for instance, all bridges in

Hopewell township begin with.....200
Princeton " " " 300
Ewing " " " 400
Lawrence " " " .....500 etc.

Similarily all bridges in the City of Trenton begin with 100.

As the next step, we gave to each principal stream within the county a key number, which was to follow the district key; that is, all bridges across the Assunpink creek bear the number 4, regardless of the township or district; likewise, if a bridge were across the Millstone river, it would have the number 6, and if across Stoney brook 3. In other words, these numbers all occupy the tens column. Now, should the stream be a principal tributary of the Assunpink or Millstone it would bear, first, the index number of the township; next, the key number for that stream, and the following digit would then indicate whether it was a tributary of that stream. Should the bridge be cross the principal stream itself and not be on a tributary at all, the next figure very logically becomes a cipher.

Thus we have in the first three figures the township, stream and tributary fixed. We then use a period, and the next figure indicates the number of the bridge on the tributary or main stream. That is to say, the numerical arrangement of that bridge itself is taken care of at this point, the numbering commencing at the mouth of the stream or tributary.

To give a concrete example: A bridge bearing the number 541.7 shows, first, that this bridge is in Lawrence township because it is among the 500 series; next, being in the 40 series places it on the Assunpink or a tributary; while the next figure shows that the structure is not bridging the Assunpink direct, but a tributary thereof, and furthermore that it is the first tributary in that township, counting from the mouth of the stream. Now we have arrived at the decimal point. The figure following the point shows the relative position of that bridge to all other bridges on that particular stream.

The question may arise as to how a bridge would be numbered which spans a stream forming the boundary between two townships. This very frequently occurs. We meet this situation by adding one more number in the hundreds, bearing the key number of one of the two townships and separating this from the adjoining township key figure by a dash; thus 6—540.3 shows at once that this is a township line bridge, and at the same time both townships are indicated and the additional information as to stream location.

In order not to complicate the system unduly, it is well not to carry the refinements to extremes. This is particularly true if you attempt to carry the tributary numbering too far. The principal point in favor of the system, however, is the fact that the geographical location of a structure automatically fixes its number. Or conversely, if reference is made in a resolution or a report to bridge No. 740.1, as an example, you immediately are able to locate this on your index map to within a very small area without effort, while if all the bridges in the county were numbered consecutively it might take considerable time to search for its location, especially where the number of bridges might exceed 1,000.

If one desired, the first set of numbers could be omitted altogether, and as an alternative, letters could be substituted for the township keys. For instance the stream key can be prefixed by

Ho. indicating Hopewell Township
P indicating Princeton "
E indicating Ewing "
L indicating Lawrence "
Ha. indicating Hamilton " etc.

This would eliminate the necessity of fixing the key figures in the mind for indicating the townships. This is, however a matter of detail. Each county has its own peculiarities which have to be worked out as separate problems.

To the several advantages which have already been noted, the ease with which new numbers can be inserted or interpolated might be added; also the ease with which the duplication of numbers can be avoided by reason of the fact that each series of numbers is confined to a very small area. As for the disadvantages, these seem to be few. At first sight the system may seem to be considerably complicated, but upon giving it some little study it will be seen that this is not the case. One important disadvantage which might be cited is that of numbering inter-county bridges where several adjoining counties had adopted this system. However, it would seem that by co-operation of the county engineers this could be very readily adjusted.

In this county we propose, after a survey has been completed of all the bridges in the county, to tabulate the information collected by the field corps on a card index system modelled after the system now in use by Mr. McClave of Bergen county. On one side of the card appears information relative to the cost of the bridge, the contractor, date when built and other pertinent data; and on the reverse side a sketch showing the type of bridge, principal dimensions of the bridge structure, etc.

Annual Paving Statistics

Facts and figures from several hundred cities concerning the amount and nature of work done by each during 1919.

The first installment of our Annual Paving Statistics, that is prepared from data secured in general response to a carefully developed questionnaire sent to all municipal paving officials in this country, was published in PUBLIC WORKS, February 7, and contained Tables 1-11, inclusive, that are respectively headed: Sheet Asphalt; Brick Pavement; Granite or Other Stone Block; Miscellaneous Pavements; Concrete Pavement; Bituminous Concrete; Resurfacing Pavements; Tar or Asphalt Macadam; Bitulithic Pavement and Macadam. Table No. 12, Labor and Contracting, was given for Alabama, Arkansas, California, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan and Minnesota. The balance of this table, for the remaining states, is given herewith and will be followed in succeeding issues by supplementary data.

The first column in Table No. 12 is in answer to the question: "By what percentage was the cost of the different kinds of pavement higher in 1919 than before the war?" The second column, to the question: "About how many unskilled laborers will be available for contract work in 1920, in the city and vicinity?"

TABLE NO. 12—LABOR AND CONTRACTING.

City and State	Increase in Cost, percentage	Common labor: Available	Common labor: Prevailing per hour or day	Common labor: Price in 1919 hours per day	Kinds of pavement laid by day labor	Kinds of pavement laid by contract
Mississippi						
Canton	....	....	2.50	10	....	....
Missouri						
Bethany	90	50	5.00	10	none	all
Brookfield	50	20	.40	9	none	all
Fulton	....	....	3.00	9	....	....
Kansas City	53-153e	....	4.00	8	....	....
Sedalia	90-100	300	4.00-4.50	10	none	all
St. Charles	....	50	3.15	9	....	....
Montana						
Billings	24	not enough	5.00	8	none	all
Nebraska						
Freemont	35	15-20	.50	9	all	none
Lincoln	50-80f	150	4.50	10	none	all
New Jersey						
Bordentown	....	50	4.50	9	none	all
Bound Brook	81	very few	4.50	9	Tarvia	stone block & brick
Camden	90	not enough	.45	..	asphalt	granite block
Collingswood	92	170	.50	9	none	all
Elizabeth	50	....	4.00	8	none	all
Garfield	35	....	4.50-5.00	8	none	all
Highland Park	....	....	4.50	9	all	none
Millville	100	....	3.00-3.50	8	gravel	....
New Brunswick	33	....	.50	8	none	all
Passaic	41	....	.60	8	none	all
Plainfield	50	not many	4.00	8	bit. macadam	brick & concrete
Summit	75	100	3.00g	8	all	none
Wallington	50	....	4.50-5.00	8	none	all
Westfield	75	25-30	4.75	9	none	all
West Orange	....	plenty	.50	..	10,000 sq. yd. Tarvia penetration	all others
New York						
Albany	60-80	200	4.00	8	none	all
Binghamton	28-43n	50% of normal	4.40	8	none	all
Brooklyn	52-128i	....	4.00	8	none	all
Ellenville	....	20	3.00	9	....	....
Elmira	44-57k	150	3.60	8	none	all
Fairport	60	100	4.00-4.50	8	none	all
Geneva	105	50	4.00-5.00	8	bit. macadam	brick & concrte
Herkimer	80	....	4.50	9	gravel	reinforced concrete
Little Falls	32	scarce	4.00	8	none	concrete
Mamaroneck	....	....	4.00	8	none	all
Niagara Falls	45	300	4.80	8	repaving	all else
Ogdensburg	....	scarce	2.75-3.00	8	resurfacing	concrete
Olean	40-50	150-200	3.60	8	none	all
Oneida	35	40	4.40	8	none	all
Poughkeepsie	80	....	3.60	8	all	none
Rochester	65	....	4.40	8	none	all
Rome	....	....	.45	..	none	all
Salamanca	98	200	4.50	9	none	all
Schenectady	100	200	4.40	8	none	all
Sidney	75	20	4.50	9	none	all
Watertown	80-100l	500	4.00	8	all	none
North Carolina						
Asheville	100	....	2.75	8	Durax	bit. concrete & concrete

TABLE NO. 12—LABOR AND CONTRACTING (Continued).

City and State	Increase in Cost, percentage	Common labor: Available	Common labor: Prevailing per hour or day	Common labor: Price in 1919 hours per day	Kinds of pavement laid by day labor	Kinds of pavement laid by contract
North Carolina						
Elizabeth City	....	100	3.00	10	....	....
Fayetteville	100	50	3.50	10	none	all
Greensboro	80	very few	3.50	10	none	all
Statesville	....	....	3.00	10	none	all
North Dakota						
Wahpeton	35	....	5.00	10	none	....
Ohio						
Akron	35	....	6.00	10	none	all
Ashland	76	50	4.00	10	none	all
Bucyrus	100	enough	4.00	10	none	concrete
Columbus	100	....	4.00	8	none	all
Conneaut	75	50	.45	8	none	all
Coshocton	100	200	4.50	10	none	all
Delaware	....	100	4.00	10	....	....
East Palestine	100†	none	4.00-5.00	8	none	all
Edgerton	....	....	3.00	9	none	all
Lakewood	85	....	5.20	8	none	all
Lancaster	33	60	3.50	8	none	....
Lima	40	....	.40-.45	10	none	all
Marysville	....	50	4.00	10	....	....
Newark	....	....	.40	8	none	all
Niles	30	none	4.50	8	none	all
Perrysburg	50	....	3.50	9	none	all
Salem	....	40	4.00	8	....	....
Sandusky	....	very few	4.50	9	....	....
Sciotoville	....	40	3.50	10	all	none
Sidney	33	25	.40	9	none	all
Toledo	70	....	.50-.60	..	none	all
Zanesville	103	200	4.05	9	none	all
Oklahoma						
Altus	30	200	5.00	8	none	....
Bartlesville	75-125m	very few	5.00	8	none	all
Oklahoma City	70	....	4.00	8	none	all
Shawnee	60	300	4.00	8	none	....
Wagoner	....	100	4.00	8	....	....
Pennsylvania						
Altoona	230	very few	3.50-5.00	8	none	all
Beaver Falls	75	few	5.00	10	none	all
Berwick	....	100	3.60	9	....	....
Carlisle	....	50	3.50	..	all	none
Clearfield	60	150	4.00	10	all	none
East Bangor	....	....	3.15	9	....	....
Erie	35	200	.50	9-10	none	all
Franklin	....	40	5.00	10	none	all
Freeland	33⅓	25-30	3.30-3.60	9	none	all
Greensburg	....	none	4.50	9	....	brick
Hazleton	50	....	4.20	10	none	all
Lebanon	....	200	.35-.40	10	none	all
Lehighton	....	25	3.50	10	none	....
Media	100	plenty	4.00	8	all	none
Miners Mills	....	....	.35	..	none	all
New Castle	100	100	.42	9	none	all
Norristown	50-67	few antiques	4.05	9	all	....
North Braddock	135	....	4.50	10	none	all
North-East	50	....	.50	..	none	all
Osborn	103	....	.50	9	none	all
Philadelphia	50	....	4.50	9½	none	all
Pittsburgh	60	....	...	..	none	all
Rankin	120	....	4.50	10	none	all
Reading	100	....	3.20	8	none	all
Scranton	60	....	4.50	10	none	all
Shippensburg	50	25	.35	10	all	none
Somerset	82	....	3.50	9	none	all
Swoyersville	60	....	.35	..	none	all
Tyrone	....	40-50	4.00	9	....	....
West Homestead	100	....	4.50	10	none	all
Williamsport	53	....	5.00	10	none	all
Windber	43	....	4.00	9	none	all
Rhode Island						
Pawtucket	33⅓	....	.50-.55	..	bit. macadam	stone block, Enduro & Warrenite
South Carolina						
Clinton	40	20	2.25	10	none	all
Union	100	scarce	2.50	10	all	none
South Dakota						
Aberdeen	....	....	4.50-5.50	10	....	....
Sioux Falls	70	plenty	.50	..	none	all
Tennessee						
Clarksville	....	300	2.50	10	....	....
Dyersburg	....	100	3.00	10	....	....
Greeneville	....	scarce	3.00	10	....	....
Jackson	....	400	3.00	10	gravel	concrete & asphalt
Johnson City	....	50	3.00-3.50	10	....	....
Texas						
Beaumont	....	plenty	.37½-.50	8	none	all
Clarksville	....	400	3.00	8	....	....
Dallas	45	enough	4.00	8	gravel	all others
Gainesville	30	300	3.50	10	....	....
Hillsboro	55	....	3.00	8	....	....
Houston	28	rather scarce	.40-.50	8	none	all
Longview	70	plenty	.35	8	none	all
McKinney	85	50	3.50	8	none	all
San Antonio	50-100	1,000	2.25-2.50	8	all	none
Waxahachie	....	175-250	3.00	8	....	....
Utah						
Logan	....	....	4.00-4.50	8	....	....
Ogden	35	....	4.00	8	none	all
Provo	80	....	3.50	8	part of concrete	part of concrete
Tooelle	....	....	4.00	8	....	....
Vermont						
Middlebury	100	....	2.75	9	all	none
St. Albans	10	50	3.50	9	gravel	tar macadam
Virginia						
Covington	....	75	3.50	10	none	all
Danville	....	....	3.00-3.50	10	....	....

TABLE NO. 12—LABOR AND CONTRACTING—(Continued).

City and State	Increase in Cost, percentage	Comon labor: Available	Comon labor: Prevailing per hour or day	Comon labor: Price in 1919 hours per day	Kinds of pavement laid by day labor	Kinds of pavement laid by contract
Washington						
Aberdeen	50-55	....	5.50	8	none	all
Auburn	100	few	5.20	8	none	all
Bremerton	70-90	100-150	6.00-7.00	8	part of concrete	part of concrete
Charleston	30	enough	5.50	8	none	all
Wisconsin						
Appleton	50	....	.45-.50	8	none	all
Baraboo	33	....	.40	..	none	all
Beloit	70	75	5.00-6.00	10	....	....
Delavan	65	20-30	4.00	10	none	all
De Pere	....	200	4.00-5.00	10	....	....
Eau Claire	....	....	3.75	9	none	all
Edgerton	16	very few	4.50-6.00	10	none	all
Fond du Lac	30-50	shortage	5.00	10	none	all
Grand Rapids	lower	enough	.45†	8	all	none
Kenosha	72	1,000	5.00	9	none	all
Lake Geneva	50	40	3.50-4.50	9	all	none
Madison	23-30n	100	4.50	9	none	all
Manitowoc	100	....	.50-.55	8	....	....
Marinette	....	scarce	4.25	9	all	none
Portage	25	100	3.50	10	all	none
Racine	35	....	8.00	9	none	all
Waukesha	20	very few	4.40	8	none	all
West Milwaukee	50	....	.50-.60	..	....	....
Canada						
Charlottetown, P. E. I.	....	plenty	3.00	9	all	none

USE OF REMOVED MATERIAL

In the questionnaire from which were obtained the data given in the tables on paving, inquiry was made as to the use to which the various cities put any of the material removed in resurfacing. Such material would consist of stone and dirt from macadam pavements, stone and bituminous cement from bituminous macadam or bituminous concrete, bituminous wearing surface from old sheet asphalt, and bricks, stone blocks and wood blocks from those several types of pavements.

It was not learned that any use was made of wood blocks. Stone blocks were either redressed and relaid or were broken up for concrete or macadam. Bricks seem to find quite a variety of uses, several cities using them for building manholes, for backing and rear walls of buildings and other structures, for building sewers, where they would serve nearly as well as new bricks.

In bituminous material the old asphalt or tar has usually lost practically all of the volatile oils and the other constituents which give it "life" and is not suitable for re-use where much reliance is to be placed upon the cementing value of the bitumen. It has been used, however, for a top dressing for macadam pavements in side streets where the traffic is light and where it will frequently give a surface at least as good as, if not somewhat better than, water-bound macadam. In some cases, however, this old bituminous material is merely dumped as filling on low land. The stone and dirt from the tops of old macadam pavements are quite frequently used for constructing new macadam pavements on side streets—about the only places where the use of macadam in cities is justifiable under present traffic conditions.

Expert Urges Water Supply Be Doubled

In Asheville, N. C., following an investigation into the city's water system, covering the North Fork watershed, from which the present supply is obtained, and the Bee Tree watershed, G. Gilbert White, hydraulic engineer of Durham, who has been in Asheville for some time, recommended that immediate steps be taken to construct the 16-inch pipe line to Bee Tree; that surveys be made at once invesigating the feasibility of developing additional water supply from North Fork; he urges that plans be prepared for an available supply of ten million gallons per day, half of which ought to be delivered to the city daily; a suitable site should be found near the city for the erection of a reservoir of not less than 10,000,000 gallons; plans be made to separate the city distribution system into two districts. The increase in the use of water here has jumped 88 per cent between 1910 and 1919, he states and from 1916 to 1919, 51 per cent. He says that the 16-inch pipe from North Fork, which when new would deliver 3.2 million gallons per day, has been diminished by the usual reduction in the carrying capacity of cast iron pipes, caused by roughening of the interior, to 2.8 million gallons when the pipe was ten years old and 2.6 million gallons when 15 years old.

"The inadequacy of the present supply has been shown to be due," he says, "to the limited water shed area as well as to the size of the pipe line; as the first serious shortage was experienced during three weeks of September, 1919, when it was reported that the 16-inch pipe line at its head ran about three-fourths full.

"It is difficult to determine how much water was then flowing through the 16-inch pipe. Having in mind all the circumstances connected with the pipe line, it probably was then carrying not more than 2.0 million gallons. From other data based on rainfall, it appears that the amount of water supplied by the various streams during the dry period of 1919 was probably less than 2.0 million gallons per day, and that this was also true in November, 1917, although not so noticeable then because so much water was not being used."

Jacking a Tunnel Shield

Two miles of 6-ft. tunnel sewer in Milwaukee were recently constructed with a pair of 22,500-lb. steel shields about 9½ feet in diameter and in length. They are each driven forward by ten 60-ton hydraulic jacks operating at a pressure of 5,000 pounds per square inch and reacting against a preliminary circular wooden tunnel lining made up of rings 6 inches long consisting of ten segments each.

The segments are made from 6x6-inch pieces of maple heart timber 34¼ inches long on one side and 30¼ inches long on the other side. The long side is cut to the circumference of the shield circle by a band saw and the two triangular corner pieces removed are fastened to the straight inner side of the segment, with the concave side outwards, thus making the inner sides of the segment practically parallel circular arcs and nearly doubling the end bearings of the radial joints. The pieces thus cut off, of course, are not quite full lengths but are reduced to 13½ inches each, leaving a short tangent between their thin ends at the center of the segment.

The hydraulic jacks react against the wooden segments that distribute and transmit the pressure and are left permanently in position when the tunnel is completed by a lining of unreinforced concrete 6 inches thick.

LEGAL NOTES

A Summary and Notes of Recent Decisions—

Damages or Pollution by Sewage Disposal Plant—Noxious Odors.

(S. C.) Evidence in action for damages held to sustain finding that there was no additional pollution by defendant city's sewerage purification plant of the stream flowing through plaintiff's lands.—Sturgis v. City of Rock Hill, 100 S. E. 163.

Evidence in action for damages held to show that defendant city's sewerage purification plant, by purification of a stream nearer plaintiff's land than the plant, decreased, rather than increased, foul smells and noxious odors.—Id.

Licensing of Food Stores—Physical Examination of Proprietor—Power of City.

(Or.) Ordinance of the city of Portland, No. 35013, providing if the location of a food establishment is found to be suitable, and in proper sanitary condition, according to the ordinances of the city and the regulations of the United States as to plumbing, etc., the bureau of health shall issue a food establishment permit or license to the applicant, is definite and certain, though there is no specification of what shall constitute physical fitness in an applicant for license, or suitability in the location.—City of Portland v. Traynor, 183 P. 933.

Under its charter giving the city of Portland power to make regulations to prevent the introduction of contagious diseases, etc., the city had power and authority to adopt its ordinance No. 35013, providing for the licensing of food and soft drink establishments on approval of their location, physical examination of the proprietor, and payment of a fee.—Id.

Laundry as Nuisance—Reasonable Use of Property—"Balance of Injury."

(Ga.) The privilege of use incident to the right of property must not be exercised in an unreasonable manner, so as to unnecessarily injure another.—Holman v. Athens Empire Laundry Co., 100 S. E. 207.

Every one has the right to use his property as he sees fit if in so doing he does not invade the rights of others unreasonably judged by the ordinary standards of life and according to the notions of reasonable men; such right implying a like right in every other person, and being qualified by the doctrine that the use in the first instance must be a reasonable one, the maximum being "Sic utere tuo ut alienum non laedas."—Id. The pollution of the air, so far as reasonably necessary to the enjoyment of life and indispensable to the progress of society, is not actionable.—Id.

Every one has the right to have the air diffused over his premises, whether located in the city or country, in its natural state and free from artificial impurities, which means pure air consistent with the locality and character of the community.—Id.

Smoke is not a nuisance per se, but to be a nuisance it must produce either actual, tangible, and substantial injury to neighboring property itself, or such as to interfere sensibly wih its use and enjoyment by persons of ordinary sensibilities.—Id.

As affecting the jurisdiction of equity to restrain nuisances, there is in principle no distinction between cases of smoke, smell, noise, or gas.—Id.

In cases of nuisances, the foundation for the interference of equity rests in the necessity of preventing irreparable injury and multiplicity of suits.—Id.

The jurisdiction of equity to restrain nuisances is in aid of the legal right, when that is inadequate, and to prevent a multiplicity of suits.—Id.

The doctrine of "de minimis," as relating to injunctive relief, does not apply where the injury is appreciable, causing either actual, tangible, and substantial injury to neighboring property, or interfering sensibly with its use and enjoyment by persons of ordinary sensibilities.—Id.

The doctrine of "balance of injury," as relating to injunctive relief, is applicable in the granting or refusal of interlocutory injunctions to restrain nuisances.—Id.

In a suit to enjoin the continuance of a nuisance created by smoke alone, the plaintiff cannot be denied injunctive relief, where his case is otherwise made out, because it would injure the defendant or the public to grant it, as in such case the chancellor has no discretion at the final trial.—Id.

In a suit to enjoin the continuance of a nuisance created by smoke alone, the injuries may be balanced, and the discretion of the chancellor exercised in the grant or refusal of an interlocutory injunction.—Id.

Municipal Beach Proprietary Function—Liability for Personal Injury.

(Neb.) In absence of statute, a city maintaining a public park and municipal beach therein for bathing, etc., performs a governmental and not a proprietary function, and is not liable for personal injury to one exercising such privileges, resulting from negligence of city officers, notwithstanding an incidental revenue from rental of buildings used in connection therewith.—Caughlan v. City of Omaha, 174 N. W. 220.

Duty of City to Remove Snow From Sidewalks.

(Iowa) No duty rests upon a city to remove snow and ice from sidewalks, so long as they remain unchanged by the interference of man or other artificial cause.—Gregg v. Town of Springville, 174 N. W. 23.

Building Contractor's Factory as Nuisance—Right to Use Highway.

(Mich.) No merchant, manufacturer, or any other person has any right to use any part of highway for deposit, exhibition, or sale of his goods, or to keep goods constantly standing on the walk, or teams constantly or for any considerable portion of the time in front of his premises engaged in loading or unloading goods, notwithstanding necessity of so doing in the course of his business.—Mackenzie v. Frank M. Pauli Co., 174 N. W. 161.

Equity will not prohibit the conduct of a lawful business by a defendant on his own unrestricted premises, except as a last resort to restrain an otherwise unavoidable nuisance existing in violation of a complaining party's right.—Id.

Where building contractor's interior trim factory is not a nuisance per se, the bare fact that it may not be acceptable to near neighbors, and may produce some discomfort or inconvenience, will not in itself justify the factory's total elimination by injunction.—Id.

Duty of Officer—Compensation.

(Cal. App.) A statutory provision that a certain duty shall be performed by a specified officer means that such officer, and no other person, is chargeable with the performance of such duty, and when performed by the officer or by his authorized deputy the law regards the duty as performed by the officer, and a statutory provision for full per diem compensation of such public officer fixes the amount to be paid, regardless of who actually performs the service.—Sarter v. Siskiyou County, 183 P. 852.

Failure to Comply with Ordinance—Liability.

(Ill.) Failure to comply with an ordinance is merely prima facie evidence of negligence, and, if it does not cause or contribute to cause the injury, such failure does not impose liability.—Curran v. Chicago & W. I. R. Co., 124 N. E. 330.

NEWS OF THE SOCIETIES

Feb. 16-18.—INTERNATIONAL CITIES AND TOWN PLANNING ASSOCIATION. Annual meeting, London, England. Honorary secretary, C. B. Purdon, 3 Grays Inn Place, London, W. C., England.

Feb. 20-21.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, G. E. Warren, 210 South LaSalle street, Chicago, Ill.

Feb. 25.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 26-27.—MATERIAL HANDLING INDUSTRY. Annual Convention at New York. Secretary, Zenas W. Carter, 35 West 39th street.

March 8-9.—INDIANA SANITARY AND WATER SUPPLY ASSOCIATION. Annual Convention at French Lick, Ind. Secretary-Treasurer, L. R. Taylor, French Lick, Ind.

March 10.—VERMONT SOCIETY OF ENGINEERS. Meeting and convention at Burlington Vt. Secretary, George A. Reed, Montpelier, Vt.

March 24-25.—NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES. The first annual meeting at Chicago. Executive Secretary, John C. Frazee, Drexel Building, Philadelphia, Pa.

May 10-11.—AMERICAN ASSOCIATION OF ENGINEERS. Sixth annual convention, St. Louis, Mo. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st street, New York City.

Oct. 4-8.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln avenue, Valparaiso, Ind.

The National Federation of Construction Industries.

The first annual meeting will be held on March 24-25 at Hotel Sherman, Chicago, and will be of importance to all producers, manufacturers and distributors of construction materials, machinery and supplies, contractors, architects, engineers and municipal and financial interests connected with construction.

The purposes of the federation are to extend construction, improve its conditions by permitting close cooperative relations between the different interests concerned; to secure satisfactory conditions between the industry and the general public, including the Government, labor and consumers; by serving as an exchange between special construction interests, and by taking the initiative in investigations, policies, propaganda, legislation and other actons advantageous to the industry.

Among the subjects to be discussed at the annual meeting by the best known national and international authorities are:

Freight Traffic as affecting the construction industry, freight rates, economical packing and handling in the shipment of construction materials.

Standardization in the construction industry. During these times of high prices of material and labor and increased demand for production, standardization holds out to the industry the one great hope for making production approximate demand at a non-prohibitive price.

Foreign Trade. American construction interests are realizing and grasping as never before the opportunities for branching out into world trade. Are you taking advantage of them?

Financial Relations. Adequate financing of construction operations will be given serious consideration. The questions of Federal home loans, exemption from taxation of certain of the income from mortgages on real estate, etc., are before us.

Jurisdictional awards.

Housing.

Americanization.

The Indiana Sanitary and Water Supply Association.

The next annual convention will be held March 8 and 9 at the French Lick Springs Hotel, French Lick, Ind., where it is believed that the new departure of assembling outside of Indianapolis is justified by the advantages offered by the health resort which offers special rates for this occasion.

New Jersey Sewerage Works Association

The next annual meeting will be convened at the State House in Trenton at 11 a. m., Wednesday, February 25. The papers to be presented and discussed include:

"Some Historical Notes on Sewerage Disposal," by M. N. Baker of the Engineering News-Record editorial staff.

"A Sewer System and Sewerage Treatment Plant as a Public Utility," by I. Z. Collings, president, Collingswood Sewerage Company.

"Sewer Cleaning in Atlantic City," by Frederick T. Harper, vice president, Atlantic City Sewerage Company.

The New England Water Works Association.

The January meeting was held at Hotel Brunswick, Boston, February 11, Henry V. Macksey, president, Frank J. Gifford, secretary. The meeting of the executive committee in the headquarters at the Tremont Temple was followed by a luncheon, and in the afternoon papers were presented by Professor George F. Swain, Harvard University, on the "Creation of a National Department of Public Works," and by Edward B. Eldredge, superintendent, Water Company, Onset, Mass., on "Economy in Pipe-lines for Small Water Systems."

Concrete Road Construction Conference.

The Association of Mississippi Valley State Highway Departments held a joint conference on Concrete Road Construction at Hotel La Salle, Chicago, February 3-4.

Contractors and material and equipment men were in attendance, and the program concluded with an exhibition of stereopticon slides and moving pictures showing special features of the design and construction adopted by different highway departments and moving pictures showing the methods of constructing concrete roads.

Among the topics presented for discussion on the floor of the convention were:

Methods of Letting and General Contracting.

Methods and Arrangements.

Who Shall Furnish the Materials?

Payments for Materials Delivered on the Road.

Unloading Aggregate from Cars.

Producing Materials Locally by Portable Plants.

Plants and Plant Layouts.

Bulk Cement and Cement Storage.

Various Hauling Methods.

Stock Piles, When and Where.

Preparing the Subgrade.

The Forms.

The Mixer.

Finishing by Hand or by Machines.

Curing.

Acceptance and Payments.

American Association of Engineers.

Representatives of all chapters of the American Association of Engineers in Ohio met in Columbus January 21 and formed the Ohio Assembly of A. A. E. The objects of the state organization were defined "to initiate, co-ordinate and promote the interests and achievements of A. A. E. in the State of Ohio."

It was tentatively decided that representation in the state assembly would be on the basis of one representative from each chapter having from 20 to 100 members, two from chapters having 101 to 500 members and three from those with from 501 to 1,000 members, and that voting power would be on the basis of units of 100 members represented. Thus the representative from a chapter having not over 100 members would have one vote, while the three representatives from a chapter having between 400 and 500 members would have five votes.

A committee was appointed to draft a constitution to submit to the chapter for discussion.

Plans were discussed and agreement reached that a state secretary should be employed in the near future and state headquarters opened in Columbus. Another development of the future is to bring together all members of the state in an annual get-together meeting, partly for social purposes and

partly to discuss matters of common interest. Members and applicants of A. A. E. in Ohio now number about 1,500. Chapters are being formed at Canton, Youngstown, Newark and Marion. The existing chapters are Akron, Cleveland, Dayton, Cincinnati, Toledo, Ohio Valley, Steubenville, Ohio Northern and Columbus.

The Louisville Club of the American Association of Engineers has elected H. T. Best president, and H. B. Cassin, secretary. The Louisville Club was responsible for the recent introduction of an engineers' license bill into the Kentucky legislature

The Rapid Transit Engineers Section of the New York Chapter of the American Association of Engineers which was organized in December, now has about 200 members. The members of the section received an increase of $300 a year when the Board of Estimate of New York approved the Transit Construction Commissioners Budget on December 31. This increase was largely as a result of the efforts of L. B. Smith, assistant district secretary of the American Association of Engineers in New York.

At the first annual convention of the Southwestern District of the American Association of Engineers in Globe-Miami, Arizona, the old officers of the district, who were formerly officers of the Southwestern Society of Engineers, were re-elected. It was voted that the name be changed from the Southwestern Society of Engineers, Southwestern District of the American Association of Engineers to the American Association of Engineers, Southwestern District. Dean G. M. Butler of the college of engineering of the University of University of Arizona is president.

Major Frank T. Payne has been elected president of the Louisiana Chapter of the American Association of Engineers. Major Payne is superintendent of the state department of conservation.

At the first annual convention of the Idaho Society of Engineers, now the Idaho Chapter of the American Association of Engineers held in Pocatello on January 12, the following were elected as officers of the new organization, which is officially known as the Idaho Society of Engineers Chapter of the American Association of Engineers: President, E. B. Darlington, Jerome, Idaho; vice-presidents, C. N. Little, dean of the engineering department, State University of Idaho, and E. E. Moberly, of Pocatello. The secretary-treasurer is A. M. Ayres, of Boise. A constitution and by-laws were adopted.

The Detroit chapter has elected the following officers: P. W. Keating, president; J. S. Lillie, first vice-presipresident; E. L. Brandt, secretary; and J. T. S Southern, treasurer.

Wm. J. H. Strong, president of the Chicago Chapter of the American Association of Engineers, delivered an address at the annual dinner of the Indiana Engineering Society on Friday evening, January 23, in Indianapolis. The subject of his talk was "Advertising for the Engineer."

Material Handling Machinery Manufacturers' Association.

The next convention will be held at the Waldorf-Astoria Hotel, New York City, on Thursday and Friday, February 26-27. The program includes routine business at the first session, 10 a. m., February 26; a formal luncheon, with addresses by prominent speakers, at 12:30 p. m., and the presentation of papers on "Uses and Misuses of Material Handling Machinery," followed by their discussion, and by moving pictures in the afternoon.

On February 27 the morning session will be devoted to the meeting of the advertising council and to papers and discussions on association publicity. The afternoon session will be occupied by an outline of the plans of the association work in 1920 and by the presentation and discussion of papers on material handling machinery installations, illustrated by moving pictures.

International Waterways Commission.

The development of the St. Lawrence River for navigation and industrial purposes, between Montreal and Lake Ontario, was discussed by the joint meeting of the United States and Canadian Water Ways Commissions, held in New York, February 11.

Recommendations were invited relative to methods of procedure, cost of operations and maintenance for both countries, methods of control and extent of development of resources, commerce and industry involved.

Investigations of the Bureau of Standards.

The Bureau of Standards, Department of Commerce, announces a number of recent interesting investigations among which are the following:

Accuracy of Electrical Measuring Instruments.

An exhaustive paper on "The Accuracy of Commercial Electrical Measurements," requested by the Instruments Measurements Committee of the American Institute of Electrical Engineers has been finished and submitted to the chairman of the committee. This paper is scheduled to be given at the convention in February, in the hope of arousing interest in the further standardization of electrical instruments.

The paper discusses the accuracy required in commercial electrical measurements and the means of obtaining it, namely, proper choice, installation, use, and maintenance of instruments. Conditions of use, external disturbing influence, and features of design and construction affecting the accuracy for measuring voltage and current are mentioned. The sources of error in electrodynamic wattmeters are discussed, including the effect of instrument transformer errors. The principal factors affecting the accuracy of watt-hour meters are given. In conclusion, some improvements which should be soon forthcoming are mentioned.

INDUSTRIAL NEWS

The Ransome Concrete Machinery Company, Dunellen, N. J., have placed their New York office, 150 Nassau Street, in charge of Lemuel Smith, Jr., F. G. MacDonald and James H. Fitzgerald. Mr. Smith, who has been with the company for a number of years, has for the past two years been assistant sales manager. Mr. MacDonald has been selling Ransome Mixers in the New York territory for a number of years, and Mr. Fitzgerald, has been in charge of the Pneumatic Mixer Department of the Ransome Company for a number of years, being recognized as an authority in this line of work.

New Office Opened—The United States Cast Iron Pipe & Foundry Company announce the opening of their office in the Scollard building, Dallas Texas, in charge of T. W. Hanlon, Southwestern sales agent.

Mace Moulton, Jr., who has been for the past six years New England sales manager for the United States Asphalt Refining Company of New York and Baltimore, has formed the firm of Mace Moulton, Jr., Inc., with offices at 6 Beacon street, Boston, to handle the sale of bituminous road materials and pavements.

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The Engineering Service Corporation has absorbed and succeeded to the business of the W. K. Palmer Company, engineers, enlarging and extending the scope of that business which was developed from the personal consulting engineering practice of Mr. Palmer, established in Kansas City, in 1901.

A corps of specialists and experts, consulting, designing and supervising engineers, with the advantages of an efficient organization, will be maintained. The scope of the activities of the corporation will comprehend the engineering, organizing, financing, constructing, operating and managing of public utilities and industrial properties.

The Engineering Service Corporation will specialize in the preparation of plans, specifications and estimates,

and the supervision of construction of electric lighting plants and lighting systems, electric railways and power plants, hydro-electric plants and transmission systems, water works and water supply systems, electric railways and power plants, hydro-electric plants and transmission systems, water works and water supply systems, municipal improvements, and all kinds of factories and industrial establishments. railway locations and surveys for steam and electric railways and survey for irrigation and drainage systems, with the attendant office work: preparation of maps, profiles, topographic data, etc., also constitute a particular specialty.

Special attention will be given to expert examinations, appraisals, inspections, tests and reports, and reports necessary for the financing of new projects and the refinancing of existing properties; the construction, operation and management of utilities and industrial properties and the negotiating of securities of such properties.

The plan of organization, and the aim and purpose of the Engineering Service Corporation are designed to cover a field in which there is a demand for such combination of talent and facilities, together with financial strength as is now offered, which is necessary for the complete handling within a single institution of all organizational, legal and financial matters relating to a public utility or an industrial project as well as the details of the necessary engineering and construction work, with the advantages of centralized responsibility.

Lecture Series by Barrett Co. Staff Very Popular.

The engineering staff of **The Barrett Company, New York City,** has for several years, at the request of universities and colleges, given talks to engineering students and for road schools and technical societies, on various phases of the application of coal-tar materials to the solution of modern road problems. The interest in this work has been widespread and the colleges appear to be very glad to avail themselves of the opportunity to receive practical first hand information on highway construction work. The calendars of the lecturers are well filled and many of the colleges have requested the whole series of lectures.

The company has issued a pamphlet describing this lecture work. The following subjects are covered: "Chemistry, Manufacture and Control Testing of Refined Tars;" "The Laboratory Tests to Which Road Tars Are Subjected;" "The Construction of Pavements with Refined Tar;" "City Pavements of the Block Type;" "Wood Preservation;" "Wood Block Pavements;" "Maintenance;" and "Maintenance of Broken Stone and Gravel Roads."

Partnership Changes.

The firm of Chester & Fleming, engineers, Union Bank Bldg., Pittsburgh, Pa., announces that Thomas Fleming, Jr., has withdrawn from the firm to become associated with the Oil Well Supply Co. Daniel E. Davis, on the staff for several years, and during the war, a captain in the Construction Department of the U. S. A., has become a member of the firm. John T. Campbell, for several years in charge of designs, has become a member of the firm. The partnership will continue to operate under the established firm name of Chester & Fleming, with J. N. Chester, J. T. Campbell, D. E. Davis and J. F. Laboon as the partners.

The Material Handling Machinery Manufacturers' Association, 35 West 39th street, New York City, has issued a report describing its work in the past eight months and outlining its purposes and plans for the future. The organization succeeded in having New York City provide mechanically equipped piers instead of ordinary man-handling piers prosposed. The tremendous possibilities of mechanical handling are pointed out and the effects on important national economic questions such as the increased productivity of labor, the high cost of living, etc., are discussed. The equipment included in the sphere of the association covers cranes, hoists and winches, conveyors, elevators, industrial trucks, tractors and trailers, bulk handling machinery, etc.

Calvin Tomkins is president and Zenas W. Carter secretary of the association.

Materials Required for French Reconstruction.

The following facts regarding the magnitude of the reconstruction task confronting the French Minister of the Liberated Regions were given out by M. Labbe, Director General of the Technical Services.

Building work alone would require 22,000,000 tons of material and the labor of 700,000 people for one year; 100,000 houses are to be entirely rebuilt, requiring 5,000,000,000 bricks, 3,000,000 cubic meters of sand, 1,000,000 tons of lime, 13,000,000 square meters of tiles, and 3,000,000 cubic meters of wood. Reconstruction of highways and railroads would require 3,000,000 tons of materials and the labor of 15,000 men for one year. An addition of 20,000 trains and 5,000 trucks would be required.

"Direct Oxidation" Sewage Disposal Process.

The board of directors of the **National Lime Association** has authorized the publication of bulletin No. 200 on sewage disposal, dealing particularly with the direct oxidation process.

Big Water Scheme for English City.

The Liverpool (England) Corporation proposes laying out a fourth line of pipes from Vyrnwy Lake, in Montgomeryshire, to the corporation reservoirs at Prescot, 68 miles, as well as considerable alterations in the levels of portions of the third line, at a combined cost of approximately £5,000,000 ($24,332,000).

PERSONALS

Mullican, N. S., who has served Davidson County, N. C., several years as county highway and bridge engineer, has resigned to accept the position of highway and bridge engineer of Davie County, N. C. His new position pays a salary of thirty-six hundred, in addition to his retainer salary from Davidson County, where he will act as consulting engineer on all hard surface work.

Evarts, Charles W., health officer of New Haven county, Conn., was recently burned to death in a fire in the Chamber of Commerce Building, New Haven.

Grace, John P., was recently elected mayor of Charleston, S. C.

Collins, Thomas E., city engineer of Elizabeth for the past seven years, has been reappointed by the board of public works of that city for a term of three years.

Ledoux, J. W., consulting engineer, 112 North Broad street, Philadelphia, in order to adequately take care of his consulting engineering practice, has resigned as chief engineer of the American Pipe and Construction Company, and is now established as consulting engineer. He will specialize in water works, valuation, arbitration, rate cases, and water power development.

Hitchcock, L. B., city engineer of Phoenix, Arizona, has been elected president of the Phoenix Chapter of the American Association of Engineers. D. A. McClung, assistant county engineer, is secretary.

During the absence in Europe of A. M. E. Johnstone, the Wallace & Tiernan Co., Inc., have appointed Gilbert H. Pratt acting district sales representative for New York, New England and northern New Jersey.

Mr. Pratt was formerly chief chemist of the New York Continental Jewel Filtration Company, prior to which he was chief of the Rhode Island State Department of Health, after several years connection with the Massachusetts Health Department.